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MATHEMATICS IN PORTUGAL.

By G. A. MILLER, University of Illinois.

The fact that Portugal has so recently joined the list of republics increases interest at this time in the intellectual development of this little country with such a turbulent history. Her maritime eminence several centuries ago implies the use of mathematics at an early date and awakens the hope that we may find here independent developments of unusual value. A people that before the close of the fifteenth century found a route to India by sailing around the southern part of Africa must have possessed at an early date the basic elements of mathematics and astronomy. While the mathematical history of Portugal does not contain names that can be classed with Euler, Lagrange, Gauss, or Cauchy, yet it presents some names with which the mathematician is familiar. As such a name we may mention that of Nonius, who discovered before the middle of the sixteenth century, the fundamental properties of the important curves called loxodromes, which are important in navigation.*

Under the title "Les Mathématique en Portugal" M. Rodolphe Guimareas published in 1909 a second edition of a work which was originally prepared for the Universal Exposition of Paris in 1900. Nearly a hundred pages of this second edition are devoted to a sketch of the development of mathematics in Portugal. This is followed by a list of books and articles published by Portuguese writers together with occasional brief sketches as regards content or history. This list covers about 500 pages and constitutes a very useful aid towards obtaining a knowledge of the mathematical advances in this country.

From this list and from the historical sketch which precedes it, one can readily see that the Portuguese have been more successful in applying the results discovered elsewhere than in making important advances in pure mathematics. The professors in their foremost educational institution, the University of Coimbra, founded at Lisbon in 1290, and finally transferred to Coimbra in 1557, after having been moved to and fro several times, gained

*Cf. Cantor, *Vorlesungen über Geschichte der Mathematik*, Vol. 2 (1900), p. 390.

distinction by their ability to assimilate and adapt knowledge to local conditions and needs, rather than by making extensive additions. These general conditions help to explain the universally acceded mathematical pre-eminence of F. Gomes Teixeira, whose works are being published by the Portuguese government. Two recent volumes of these works may be of sufficient general interest to merit a brief description here.

These two volumes bear respectively the dates 1908 and 1909, and constitute volumes 4 and 5 of the collected works of Teixeira. They are devoted to a study of the properties of the remarkable curves which have received special names. Volume 4 is devoted to algebraic curves, and covers about 400 large pages, while volume 5 is devoted to transcendental curves, and covers about 500 pages. These volumes are largely a French translation of the Spanish work by the same author, entitled "*Tratado de las curvas especiales notables*," which, together with the well known work of Loria, was crowned by the Academy of Sciences of Madrid in 1899. The subject proposed by this Academy read as follows: "A methodical catalogue of all the curves of any class which have received a special name, with a succinct idea of the form, equations and the general properties of each of them, and a reference to the works or authors who first mentioned them." An extensive and meritorious work devoted to such a broad subject has evidently a wide field of usefulness, and should be of unusual interest, even to those who do not hope to penetrate deeply into mathematics, since special effort has been made to present the results in a very elementary manner. The French edition differs from the older Spanish edition in regard to the amount of space devoted to each curve, this amount being much larger, as a rule, in the former of these editions. Several curves have also been added, and as the French language is more commonly known among scholars than the Spanish, it may be assumed that the new edition will have a wider field of usefulness than the older one enjoyed. The number of distinct curves treated is about two hundred, so that the average amount of space devoted to one curve is not large. The conics were excluded, since their fundamental properties are so well known.

In the preface, the author states that he studied the form, construction, rectification and quadrature, the properties and the history of each curve. He considered the relations of each curve to the others, and indicated the problems which led to a study of them, giving references to the authors whenever this was possible. Each volume is provided with a list of the curves studied, a list of authors mentioned and a Table of Contents, so that it offers a convenient work of reference. It was printed at the University Press of Coimbra and published by order of the Portuguese government.

With respect to mathematical journals, Portugal has also a very respectable record, if we bear in mind that her area and population are both much less than those of the State of Pennsylvania. The two journals which

are most favorably known among mathematicians were founded by Teixeira. The older of these, entitled *Jornal de sciencias mathematicas e astronomicas*, was founded in 1877. It was superseded in 1905 by the *Annals Scientificos da Academia Polytechnica do Porto*, which is not restricted to mathematics, but has thus far devoted considerable space to this subject. The second number of the current volume begins with an article by P. Appell on the deduction of the polynomials of Hermite from those of Legendre.

From what precedes it is evident that the youngest sister republic cannot be classed with the foremost mathematical countries of the world, but it is equally true that, if we consider her size and population, she has made a very respectable record and is doing so at the present time. It is to be hoped that the new form of government will tend to elevate the educational opportunities of the masses and to put new life also into the higher institutions. In the sixteenth century Lisbon was one of the intellectual centers of Europe, and the later scientific achievements under adverse conditions inspire the hope that with the improvement of these conditions there may come a return of intellectual eminence. Even at the present time some of the Portuguese literature has decided value, both for the investigator and also for those who seek general mathematical knowledge.

ON THE NEW COURSE IN MATHEMATICS IN THE JAPANESE NORMAL SCHOOLS.

By YOSHIO MIKAMI, Phara in Kazusa, Japan.

The Department of Education of the Japanese government recently issued a new course in mathematics for the normal schools; that is, for the schools where the teachers of the primary schools are educated. The courses for men students are not the same as those for women. We begin by giving a brief account of the former.

The course consists of two parts, requiring one and four years respectively. In the former of these (the preliminary course) six hours per week are devoted to mathematics, while the number of hours devoted to this subject during each week of the remaining four years are respectively four, three, three, and two. Hence the total number of hours devoted to mathematics in these normal schools is somewhat less than that of the middle schools.

The six hours of mathematics in the preliminary course are devoted to arithmetic, such as is taught in higher primary schools.*

*In Japan primary schools have two courses, ordinary and higher. The ordinary course lasts six years and the other two years. Children are admitted to the primary school when they reach their sixth year.